

SHRIMP IN THE SNÆFELLSNES AREA – RÆKJA VIÐ SNÆFELLSNES

Pandalus borealis

THE FISHERY

The fishing ground for shrimp in the Snæfellsnes area is defined by Kolluáll, southern part of Breiðafjörður and Jökuldjúp. Shrimp catch in the Snæfellsnes area was high from 1992 to 1995, when the annual catch reached almost 7 000 tonnes (Figure 1). It is likely that high fishing pressure during that time led to a collapse of the shrimp stock. The shrimp catch was low from 1997 to 1999 but increased after 2007 until it reached a maximum in 2012-2014. Catch per unit effort increased from 1998 to 2014 but fluctuated greatly during that period. The number of commercial shrimp vessels in the Snæfellsnes area increased sharply until 1994 when 47 vessels landed shrimp. In 2006, few vessels landed shrimp, but the number increased again in the following years until 2015 when it decreased again.

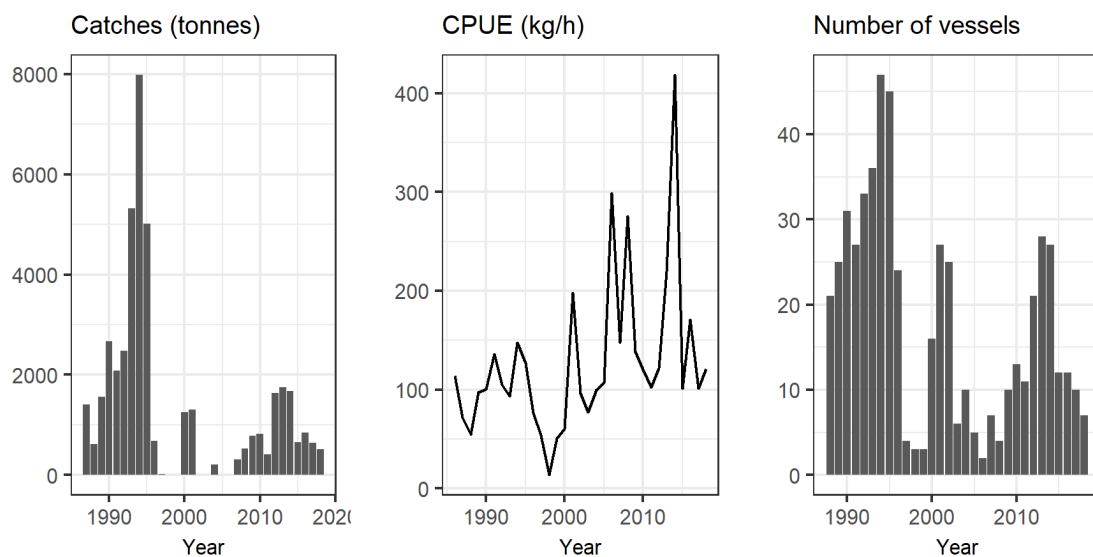


Figure 1. Shrimp. Total catch, catch per unit effort and number of commercial vessels in the Snæfellsnes area.

Mynd 1. Rækja. Heildarafli, aflí á sóknareiningu og fjöldi skipa á rækjuveiðum við Snæfellsnes.

The distribution of the fishery has varied over time (Figure 2). Between 1988 and 1996, the main fishing grounds were in the western part of the Snæfellsnes area (Kolluáll). Since 2006 the main fishing grounds have been closer to land, northwest of the Snæfellsnes peninsula.

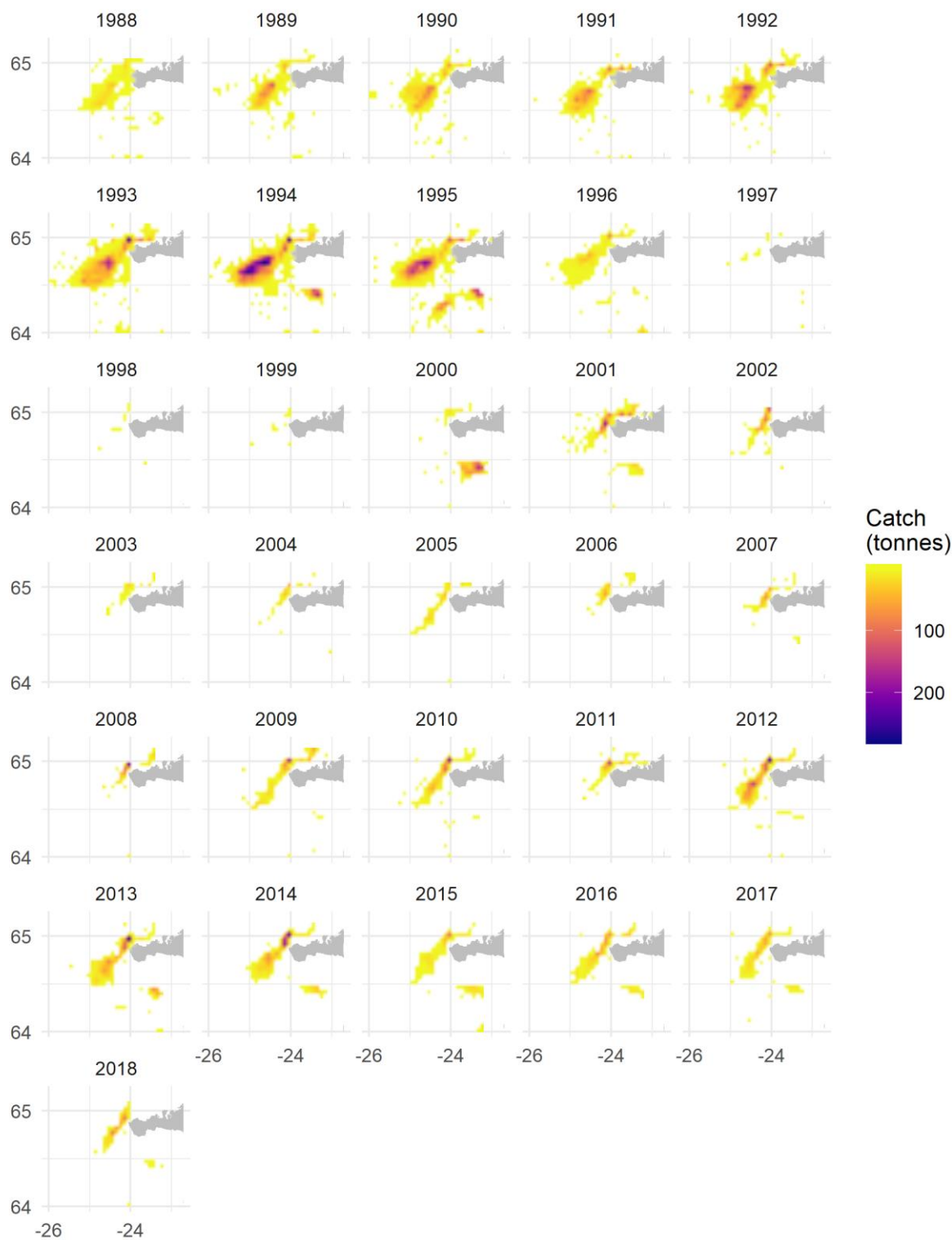


Figure 2. Shrimp. Distribution of shrimp catch in the Snæfellsnes area.

Mynd 2. Rækja. Dreifing rækjuaflla við Snæfellsnes.

SURVEY DATA

The annual Icelandic shrimp survey has been conducted since 1990 in the Snæfellsnes area. The 2019 survey was conducted on 8–12 April and included 29 fixed stations at depths of 115–320 m. Due to bad weather conditions, two stations at the outer Jökuldjúp area could not be sampled. Information on sampling procedure can be found in the report 'Northern shrimp research in Icelandic waters, 1988–2015' (Jónsdóttir et al. 2017).

In the past, the density of shrimp was usually greatest in Breiðafjörður (north of the Snæfellsnes peninsula) but less at the western part of the area (Kolluáll) (Figure 3). However, in 2017–2019 the shrimp density was low in Breiðafjörður compared with previous years.



Figure 3. Shrimp. Distribution and abundance of shrimp in the annual shrimp survey.

Mynd 3. Rækja. Útbreiðsla og magn rækju í stofnmælingu.

INDICES

Four indices are used to assess the state of the stock; total biomass, fishable biomass, female biomass and juvenile biomass. Juveniles include all individuals equal to and below 13 mm carapace length while the fishable biomass index includes all individuals equal to and above 15.5 mm carapace length. Individuals between 13 and 15.5 mm carapace length are divided between the juvenile and fishable biomass indices. The female biomass includes all females.

All the indices have fluctuated greatly without a clear long-term trend during the study period (Figure 4). The indices decreased sharply in 1995-1998 during the time of high fishing pressure. Since 2008 the indices have fluctuated around the long-term mean. In 2017-2019, the indices were substantially lower compared with previous years and were the lowest observed since 2007. The total biomass index was above the reference level where the state of the stock is considered critical. The juvenile index fluctuated without a trend from 1990 to 2013 but it has been very low since 2014.

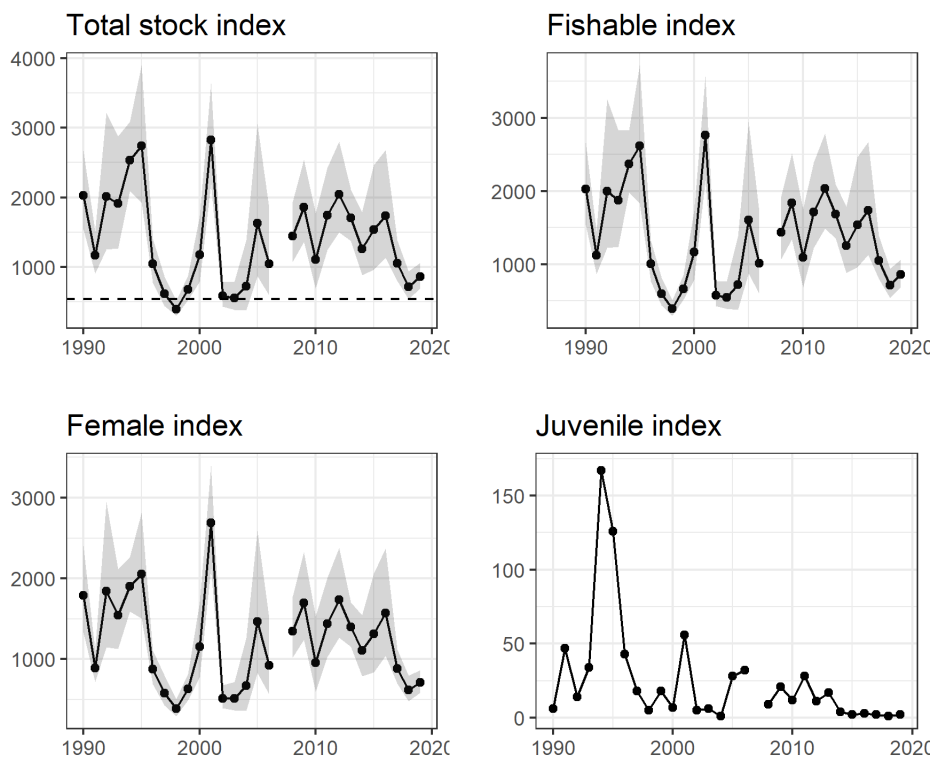


Figure 4. Shrimp. Stock biomass index, fishable biomass index, female biomass index and juvenile biomass index of shrimp. The horizontal line indicates a value where the state of the stock is considered to be critical (20% of the mean of the three highest indices).

Mynd 4. Rækja. Heildarstofnsvísitala, veiðistofnsvísitala, kvendýravísitala og vísitala ungrækju við Snæfellsnes. Lárétt lína sýnir viðmiðunargildi fyrir ástand stofnsins (20% af meðaltali þriggja hæstu vísitalna).

LENGTH DISTRIBUTION

A high proportion of the stock is mature females, whereas males compose a considerably lower proportion of the fishable biomass (Figure 5). The absence of juveniles indicates that the recruitment patterns and drift of larvae from adjacent areas are unknown. In 2019, the abundance of males and immature females was lower compared with the mean length distribution of the whole study period.

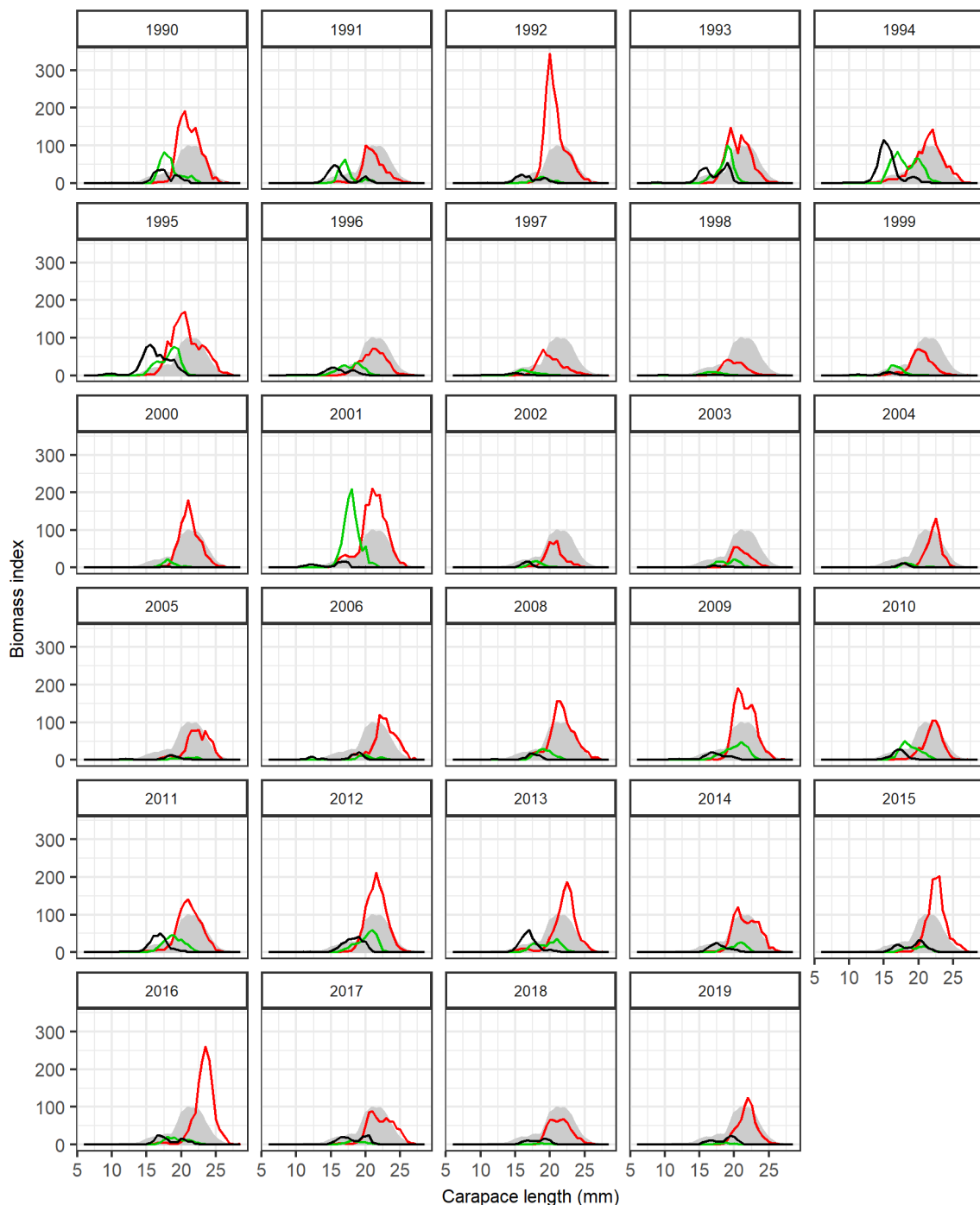


Figure 5. Shrimp. Length distribution of shrimp. The black line indicates males, the green immature females, and the red line mature females. The grey area is the mean length distribution of both sexes for the whole study period.

Mynd 5. Rækja. Lengdardreifing rækju í stofnmælingu. Svört lína sýnir karldýr, græn lína ókynþroska kvendýr og sú rauða kynþroska kvendýr. Gráa svæðið sýnir meðallengdardreifingu beggja kynja allt rannsóknatímabilið.

ABUNDANCE OF COD AND HADDOCK

In general, the cod abundance index was relatively high between 1994 and 2006 but has decreased steadily since 2008 (Figure 6). The haddock abundance index has fluctuated during the study period, whereas it was highest in 2001. The haddock index has been relatively low since 2008, but in 2019 it increased and was at similar levels as before 2009.

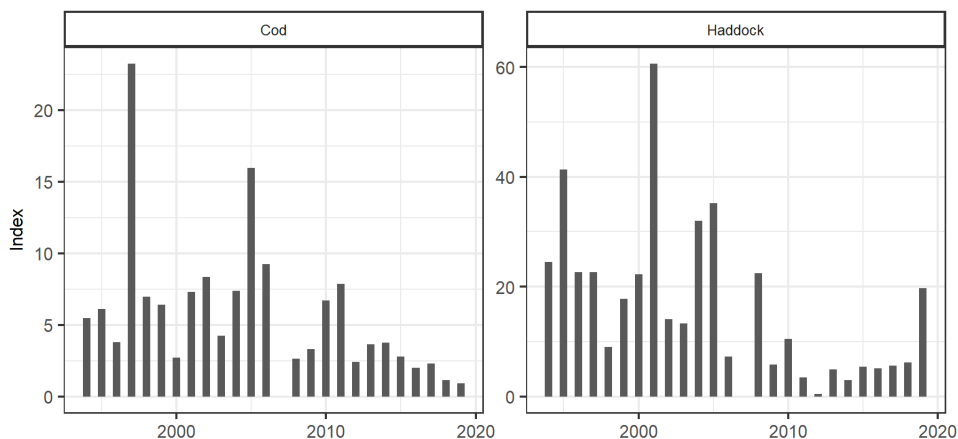


Figure 6. Cod and haddock. Abundance indices in the annual shrimp survey.

Mynd 6. Þorskur og ýsa. Vísitölur í stofnmælingu rækju við Snæfellsnes.

MANAGEMENT

The Ministry of Industries and Innovation is responsible for management of all marine fisheries in Iceland and implementation of legislation. The Marine and Freshwater Research Institute (MFRI) first recommended TAC for shrimp in the Snæfellsnes area in 2002, but until 2014 this area was included with the offshore shrimp fishery and hence, no TAC was issued specifically for this area. For the quota years 2010/2011 to 2013/2014, the offshore shrimp fishery was open to all boats without a TAC. During some of these years, fishing of shrimp in the Snæfellsnes area was considerable higher than the recommended TAC (Table 1). In 2015, the MFRI suggested that the quota year for the area begins at 1 May and ends on 15 March. Shrimp fishing has since been prohibited in the period 16 March to 30 April.

Table 1. Shrimp. Biomass index, state of the stock (relative to the mean of the three highest indices), advice, catch (tonnes in fishing year) and F_{proxy} .

Tafla 1. Rækja. Heildarstofnsvísitala, ástand stofns (vísitala miðað við meðaltal þriggja hæstu vísitölu gilda), ráðgjöf, afli og vísitala veiðihlutfalls (F_{proxy}).

Year	Biomass index	Relative state	Rec. TAC	National TAC	Catch	F_{proxy}
1990	2 030	0.75			1 597	0.79
1991	1 170	0.43			2 111	1.80
1992	2 008	0.74			5 035	2.51
1993	1 909	0.71			4 809	2.52
1994	2 536	0.94			6 765	2.67
1995	2 741	1.02			2 432	0.89
1996	1 048	0.39			283	0.27
1997	616	0.23			11	0.02
1998	395	0.15			8	0.02
1999	681	0.25			65	0.10
2000	1 173	0.43			2 257	1.92
2001	2 821	1.05			506	0.18
2002	584	0.22	300		89	0.15
2003	555	0.21	200		209	0.38
2004	725	0.27	200		265	0.37
2005	1 631	0.60	200		238	0.15
2006	1 042	0.39	200		316	0.39
2007			400		530	
2008	1 445	0.53	400		779	0.54
2009	1 858	0.69	900		830	0.45
2010	1 106	0.41	450		414	0.37
2011	1 735	0.64	850		1 632	0.94
2012	2 057	0.76	1 000		1 755	0.86
2013	1 704	0.63	950		1 698	1.00
2014	1 258	0.47	600	600	133	0.11
2015	1 540	0.57	700	700	589	0.38
2016	1 739	0.64	820	820	826	0.47
2017	1 054	0.39	698	698	645	0.61
2018	715	0.26	442	442	516	0.73
2019	858	0.32	393			

ADVICE 2018

The Icelandic shrimp survey was used as a biomass indicator. The target F_{proxy} (catch/survey biomass) of 0.5 is considered precautionary based on the historical relationship between catch and survey index. The advice is based on multiplying the target F_{proxy} with the mean of the two most recent index values.

The state of the stock is considered critical if the total biomass index is below 540 (equivalent to a relative state of 0.2; the biomass index divided with the mean of the three highest indices). The biomass index value of 540 can therefore be considered a proxy for B_{lim} or an I_{lim} . If the total biomass index is below 540, zero catch is advised, else the advice is based on multiplying the mean of the two most recent index values with the target $F_{\text{proxy}} = 0.5$.

In April 2019, the total biomass index was above 540. Hence, MFRI advises that catch in the Snæfellsnes area should be no more than 393 tonnes in the period from 1 May 2019 to 31 March 2020.